Pediatric Voiding Dysfunction: Current Evaluation and Management

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The prevalence of pediatric voiding dysfunction and daytime incontinence is difficult to determine due to varying definitions of urinary incontinence (UI) and different study designs. Furthermore, few studies have evaluated the prevalence of the different types of voiding dysfunction in children. The prevalence of daytime wetting varies with age and gender. Overall rates vary from 1% to 10%. In 6 to 7-year-old children, the rate is between 2% to 4%, with a rapid decrease in subsequent years (Bloom, Seeley, Ritchey, & McGuire, 1993; Bower, Moore, Shepherd, & Adams, 1996).

LITERATURE REVIEW

Several studies have been performed assessing the prevalence of daytime incontinence in school-aged children. Kajiwara, Inoue, Usui, Kurihara, and Usui (2004) evaluated the micturition habits and prevalence of daytime urinary incontinence in 6,917 Japanese primary school children ages 7 to 12 years. Daytime UI was defined as any involuntary leakage of urine during the daytime occurring more than once per month in the 6 months prior to the survey. Dampness of the underwear was included as leakage. The prevalence of daytime UI was 6.3%, equally affecting males and females. Wetting more than once per week during the day was noted in 3.6% of the children and daily wetting in 1.2%. The spontaneous resolution rate for diurnal incontinence was 18% in children between 7 to 10 years of age. With respect to the types of daytime UI, 94.6% of the children had associated urinary urgency, and 23.8% had urinary frequency; 4.5% wet themselves during coughing, sneezing, and laughing. Children with daytime UI had a higher incidence of urinary tract infections (UTIs) and constipation.

Sureshkumar, Craig, Roy, and Knight (2000) used a population-based cross-sectional survey of new entrant primary school children in Sydney, Australia, to assess the prevalence of daytime UI. Their results showed 19.2% of

Objectives

1. Explain the clinical impact of voiding dysfunction and UI.
2. Describe the evaluation process of children with voiding dysfunction.
3. Identify and describe two behavioral therapies for voiding dysfunction in children.
4. Discuss benefits and limitations of various pharmacologic therapies for children with voiding dysfunction.
5. Explain minimally invasive and surgical alternatives to treating voiding dysfunction in children.

Voiding dysfunction and urinary incontinence in children is common. Both are associated with significant effects on quality of life and co-morbidities, including urinary tract infections (UTIs) and constipation. A thorough history, physical examination, and non-invasive evaluation are essential in determining the etiology. Interventions, such as behavioral therapy/biofeedback and pharmacologic therapies, are primary treatments. Prevalence rates, current evaluation, and management techniques are discussed in this article.

Key Words: Voiding dysfunction, urinary incontinence, urinary frequency, constipation, urinary tract infection, anticholinergic therapy, urodynamics, Interstim® neuromodulation therapy, children, pediatrics.
children had at least one episode of daytime wetting in the 6 months prior to the study, 4.2% had wet two or more times per month, and 0.7% wet on a daily basis. Only 16% of the children with daytime wetting sought medical attention. Even in the group of children with daily daytime wetting, 40% had not received any medical help. Predisposing factors associated with daytime UI were family history, female gender, and a history of recent emotional stress (Sureshkumar et al., 2000).

An Australian study assessed the prevalence of enuresis in a sample of school-aged children 5 to 12 years of age. The study identified a prevalence of 2% for isolated daytime wetting and 4% for day and nighttime wetting. The prevalence of any daytime wetting was 5.5%. A gender bias was not identified for daytime wetting (Bower et al., 1996).

Hellström, Hanson, Hansson, Hjälmås, and Jodal (1990) evaluated micturition habits and prevalence of UI in 3,607 7-year-old children entering school. Six percent of girls and 3.8% of boys had diurnal incontinence. Wetting every week was reported in 3.1% girls and 2.1% boys. In those children with diurnal incontinence, urgency was reported in 82% of girls and 74% of boys.

Some studies indicate that incidence of overactive bladder is more common than dysfunctional voiding. In a study of 1,000 children with voiding dysfunction, Hoebeke, Van Laecke, Van Camp, Raes, and Van de Walle (2001) noted that two-thirds had overactive bladder and one-third experienced dysfunctional voiding. Hellerstein and Linebarger (2003) noted in a study of 22 children based on clinical information that 76% of children appeared to have overactive bladder, while only 1% had dysfunctional voiding.

IMPACT

It is well known that voiding dysfunction and UI can significantly affect quality of life, but they are also associated with an increased risk of UTIs and constipation. Voiding dysfunction and UI together may delay resolution of vesicoureteral reflux, if present (Koff, Wagner, & Jayanthi, 1998). The increased risk of UTIs may be related to underlying constipation and may also be associated with the higher bladder pressures that are seen in children with both overactive bladder and dysfunctional voiding. Overactive bladder and dysfunctional voiding may produce transient episodes of decreased blood flow to the bladder mucosa (Mitterberger et al., 2007). This increased activity of the pelvic floor muscles may also create a milk back phenomenon, whereby bacteria in the proximal urethra are milked back into the bladder via contraction of the pelvic floor muscles.

Underlying constipation may also exacerbate overactive bladder symptoms (Warne, Godley, & Wilcox, 2004). In a study of 234 constipated children, 29% were noted to have daytime UI. When constipation was relieved in 52% of the patients, these children ceased to have UTIs, and 80% had resolution of daytime UI (Loening-Bauke, 1997).

Finally, dysfunctional voiding may have an impact in children with known vesicoureteral reflux. Dysfunctional voiding may increase the risk of UTIs; however, it also appears to prolong the rate of resolution of vesicoureteral reflux (Koff et al., 1998).

The ramifications of pediatric voiding dysfunction and incontinence extend beyond the childhood years. Fitzgerald, Brown, Wassel, and Brubaker (2006) studied a population-based cohort of 2,109 women 40 to 69 years of age in a health maintenance organization. The authors noted that women who reported daytime urinary frequency were more likely to report adult urgency (odds ratio [OR] 1.9, 95%; confidence interval [CI] 1.3 to 2.6; p < 0.001) and that childhood daytime incontinence was associated with adult urgency UI (OR 2.6, 95%; CI 1.1 to 5.9; p < 0.05). Minassian, Lovatsis, Pascali, Alarab, and Drutz, (2006) noted a higher prevalence of childhood voiding dysfunction in women who had urinary frequency, urgency, stress urinary incontinence (SUI), and urgency urinary incontinence (UUI).

TERMINOLOGY

Functional incontinence is a term applied to incontinence that is unrelated to congenital, anatomical, or neurologic abnormalities. Functional UI may be caused by disturbances in the filling (storage) phase, the voiding phase, or a combination of both. Both storage and voiding phase dysfunctions are associated with an increased risk of UTIs.

According to the International
Table 1. Types of Functional Incontinence

<table>
<thead>
<tr>
<th>Urge Syndrome (Overactive Bladder)</th>
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<tr>
<td>• Frequent episodes of urgency (sudden compelling desire to void that is difficult to defer) countered by contractions of pelvic floor muscles and holding maneuvers (squatting, crossing legs, sitting on heels).</td>
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<td>• Symptoms felt to be related to underlying detrusor overactivity.</td>
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<td>• Bladder capacity is small. Voiding pattern is normal with appropriate relaxation of pelvic floor muscles; increased risk of UTIs and constipation.</td>
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<td>• Constipation may serve to trigger detrusor contractions by stimulation of stretch receptors in the bladder wall by the extrinsic fecal mass, or the colonic contractions may increase detrusor contractions via shared neural pathways (Franco, 2007).</td>
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<tr>
<th>Dysfunctional Voiding</th>
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<td>Different types:</td>
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<td>• Staccato voiding – Bursts of pelvic floor muscle activity during voiding causing interruption in the flow of urine. Flow duration is prolonged and bladder emptying is incomplete (see Figure 1).</td>
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<td>• Fractionated voiding – Micturition occurs in several small fractions, emptying is incomplete due to hypo-activity of the detrusor muscles. Abdominal muscles are used to increase the bladder pressure during voiding (valsalva voiding). Irregular but continuous flow rate. Voiding frequency is low, bladder capacity is large.</td>
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<td>• Poor bladder emptying secondary to underactive detrusor (lazy bladder syndrome) – May be a long-term result of dysfunctional voiding related to detrusor decompensation. No detrusor contraction during voiding; abdominal pressure drives voiding. Large post-void residual and recurrent UTIs are common.</td>
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<td>• Non-neurogenic neurogenic bladder (Himman-Allen syndrome). May be the end stage of voiding dysfunction. Must rule out neurologic abnormality. Decreased bladder capacity and poor compliance noted on urodynamics. Detrusor overactivity is often present; increased activity of pelvic floor muscles during voiding (see Figure 2). Must be followed closely because there is risk for upper tract damage.</td>
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<td>• Dysfunctional elimination syndrome – Used to describe coexistence of significant constipation/encopresis and dysfunctional voiding.</td>
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<th>Other Conditions</th>
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<tr>
<td>• Voiding postponement – Postpone imminent micturition until overwhelmed by urgency. Thought that overactivity of the urethral sphincter is a behavioral mal-adjustment because there is a higher frequency of behavioral issues in these children compared to children with overactive bladder (Lettgen et al., 2002).</td>
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<tr>
<td>• Giggle incontinence – Etiology not known, but there are 2 theories. One theory is that laughter induces a generalized hypotonic state with urethral relaxation; the other is that laughter triggers the micturition reflex overriding central inhibitory mechanisms (MacKeith, 1959; Williams, 1984).</td>
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<td>• Vesicovaginal entrapment (vaginal reflux voiding) – May be secondary to labial adhesions, funnel-shaped hymen, or inappropriate positioning on the toilet bowl.</td>
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<td>• Primary bladder neck dysfunction – Not commonly identified in children. Diagnosed by video urodynamics, or delayed or incomplete opening of bladder neck during voiding. Low flow rate but no increase in pelvic floor muscle activity. Symptoms include hesitancy, frequency, urgency, decreased force of stream, pelvic pain/discomfort with voiding, feeling of incomplete emptying, and sometimes incontinence.</td>
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History

History is often obtained from the parent/caregiver but should also include the child. Often, parents of toilet-trained children will not be aware of their child’s bowel regimen or voiding habits at school. The history should take into account perinatal history, timing of developmental milestones, the child’s mental status (attentiveness, academic performance at school, behavioral issues, fine and gross motor coordination), toilet-training process (delayed or prolonged, never achieved), family issues (family stressors that include move, separation/divorce, death, new siblings), history of sexual abuse, and the child’s current voiding and bowel regimen. Children with attention deficit hyperactivity disorder have a greater risk of incontinence and may be more challenging to treat (Crimmins, Rathbun, & Husmann, 2003; Duel, Steinberg-Epstein, Hill, & Lerner, 2003). An association between dysfunctional voiding and dysfunctional elimination syndrome has been noted in children with a history of sexual abuse. In a study of 300 patients evaluated for voiding dysfunction over a 3-year period, 18 with dysfunctional voiding had a history of sexual abuse preceding the onset of urinary symptoms (Ellsworth, Merguerian, & Copening, 1995). Additional information should be obtained about prior UTIs regardless of whether the child was febrile and if any radiologic workup was performed. Table 2 lists several questions that can help identify the child’s voiding and bowel regimen.

A list of current medications should be obtained since many medications may affect bowel function. A family history of voiding/bowel issues should also be assessed because there appears to be some familial tendencies for overactive bladder. A list of prior surgeries should be documented.

Physical Examination

A focused physical examination should be performed on all children presenting with voiding dysfunction or UI. Simply watching the child walk through the office door can provide useful information regarding the child’s neurologic status. An abdominal examination should be performed to assess for abdominal masses, a distended bladder, or stool-filled colon. The child’s back should be examined to assess for significant scoliosis/kyphosis and asymmetry of the buttocks, legs, or feet, as well as other signs of occult neurospinal dysraphism in the lumbosacral area (subcutaneous lipoma, skin discoloration, hair growth) (see Figure 2). A neurological examination should be performed to assess for abdominal masses, a distended bladder, or stool-filled colon. The child’s back should be examined to assess for significant scoliosis/kyphosis and asymmetry of the buttocks, legs, or feet, as well as other signs of occult neurospinal dysraphism in the lumbosacral area (subcutaneous lipoma, skin discoloration, hair growth) (see Figure 2). A neurological examination would include assessing perineal sensation and lumbosacral reflexes (standing on toes, anal reflex, and tone and bulbocavernous reflex). The genitalia are examined, including the location and size of the

Table 2. Voiding and Bowel Habit Questions

<table>
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<tr>
<th>Voiding</th>
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<td>Does your child void in the morning immediately upon awakening?</td>
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<td>Does your child need prompting to void?</td>
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<td>How often does your child go to the bathroom to void?</td>
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<td>Does your child have a single stream when voiding, or is it interrupted?</td>
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<td>Does you child exhibit any holding maneuvers (squatting, crossing legs, sitting on heels)?</td>
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<td>Does your child leak urine during the day, and if so, how many times per day?</td>
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<tr>
<td>Does your child leak urine at night, and if so, how many nights per week?</td>
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<td>What is the volume and type of fluid intake (especially caffeine)?</td>
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<td>Is your child given permission to void at school when needed (older children) or prompted to void at regular intervals (younger children)?</td>
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<tr>
<th>Bowel</th>
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<tr>
<td>How often does your child move his or her bowels?</td>
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<tr>
<td>Does your child have any fecal soiling?</td>
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<tr>
<td>What are the characteristics of your child’s stool? Are they hard, pellet-like, very large, or very small?</td>
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Figure 2. Abnormal Gluteal Cleft
urethral meatus. In girls, labial adhesions should be ruled out.

**Laboratory Tests**

A urinalysis should be performed to rule out glucosuria, bacteriuria, proteinuria, hyposmolarity (low specific gravity), and pyuria.

**Ancillary Tests**

A bladder scan, PVR determination, and uroflow/EMG are useful adjuncts in the evaluation and diagnosis of a child with voiding dysfunction. In addition to assisting the provider to determine the etiology of voiding dysfunction, these tests provide the child with tangible evidence of the underlying voiding dysfunction and may serve as forms of biofeedback in managing the child’s voiding dysfunction. With a uroflow, the practitioner can show the child whether he or she is voiding with a normal stream (a bell shaped curve) or if there is dysfunctional voiding (a staccato or fractionated stream). In an EMG display, the child can identify his or her pelvic floor muscles and visualize the increase or decrease in EMG activity based on the contraction or relaxation of pelvic floor muscles. A normal pattern on uroflow/EMG is associated with silencing of the pelvic floor muscle activity occurring prior to the onset of voiding and continuing until voiding is complete. A prolonged voiding pattern on the uroflow/EMG without increased pelvic floor muscle activity in a male should raise the suspicion of bladder outlet obstruction, a urethral stricture, or posterior urethral valves (Figure 3).

Normally, a child should be able to empty to a PVR of only 5 cc. An increased PVR (in the authors’ practice, PVR > 20 cc but varies with the age of the child and whether there is a history of UTIs) should prompt further evaluation and the institution of a double voiding regimen (void once, wait a minute, and then void again).

A renal/bladder ultrasound should be performed in males who present with daytime UI to rule out posterior urethral valves and in children with a history of UTIs who have not had a previous radiologic evaluation. A VCUG is generally obtained in males with a history of UTIs (febrile and nonfebrile) and in whom the renal/bladder ultrasound demonstrates a distended bladder with a thickened bladder wall or a dilated posterior urethra with or without hydronephrosis. Girls with a history of febrile UTIs or with an abnormal renal ultrasound (hydronephrosis, renal scarring) should have a VCUG as well. It is useful to have a renal/bladder ultrasound performed with pre and post-void bladder volume determinations. However, the child is often prompted to drink excessive amounts of fluids to ensure that the bladder is “full” at the time of the study. This may lead to a very distended bladder at the time of the study and inadequate emptying of the bladder related to the marked distention. Therefore, the child should drink some fluids an hour or so prior to the study and try not to void within an hour or two of the study. The goal is a full but not markedly distended bladder. Further, it is recommended that a kidney/ureter/bladder (KUB) plain film be obtained in children in whom there is a suspicion of constipation (see Figure 4).

Further tests, such as urodynamics studies (UDS) and magnetic resonance imaging (MRI) of the spine will be dictated by the child’s history, physical examination, and response to therapy. UDS testing is reserved for those children who fail behavioral and
medical therapy and those with suspected neurologic lesions. MRI of the spine is obtained to rule out a tethered cord when there is a lumbosacral skin abnormality, or if there is an abnormal plain X-ray of the spine.

Management

Despite the prevalence of pediatric voiding dysfunction and daytime wetting, there is a paucity of well-designed studies evaluating the therapeutic impact of various behavioral and pharmacologic therapies. A Cochrane review (Sureshkumar, Bower, Craig, & Knight, 2003) evaluating therapies for UI in children from 1996 to 2001 identified only five studies that used a randomized controlled design. Of these five studies, one evaluated the use of alarm therapy for daytime UI, and four studies evaluated pharmacotherapy. Two of these pharmacotherapy studies evaluated terodiline, an agent that has been withdrawn from use due to cardiac toxicity. Of the two remaining studies, one evaluated the use of imipramine, which did not significantly increase maximum functional bladder capacity, and the other study evaluated oxybutynin versus biofeedback. This study did not show a decrease in the percentage of children with no improvement in the frequency of daytime wetting after nine months of treatment with either biofeedback or oxybutynin (Ditropan®).

Behavioral Therapies

Behavioral therapy starts with education regarding normal bladder function and responses to urgency. Children are placed on a timed voiding regimen of every two to three hours and are instructed to avoid caffeinated, carbonated, and highly acidic fluids. The goal of behavioral therapy in children with urge syndrome/overactive bladder is to learn to suppress the first sensation of need to void by normal central inhibition rather than emergency procedures, such as squatting, that attempt to provide urethral compression. With dysfunctional voiding, the goal is to have children learn to void with a completely relaxed pelvic floor and to avoid using abdominal pressure to void.

Biofeedback is a technique in which physiological activity is monitored, amplified, and conveyed to the patient as visual or acoustic signals. These signals provide the patient with information about unconscious physiological processes and have been used for both voiding phase (dysfunctional voiding) and filling/storage phase (detrusor overactivity) abnormalities. McKenna, Herndon, Connery, and Ferrer (1999) developed a program utilizing computer games integrated into the pelvic floor muscle training program and found that it engaged children and maintained their attention. In children with diurnal enuresis, improvement was noted in 89% with 61% cured. Constipation improved in 100% and resolved completely in 33%. Encopresis also improved in 100% and resolved in 73%. Biofeedback is limited by the ability of the child to cooperate with the health care provider who is running the session. Children with learning disabilities and behavioral problems are not ideal candidates for biofeedback.

Pharmacologic Therapy

Pharmacologic therapy has a role in pediatric voiding dysfunction. Currently, only anticholinergic agents are approved for use in pediatric urge syndrome/overactive bladder. Alpha blockers are being used off-label in children with symptoms suggestive of primary bladder neck dysfunction, although they are not currently approved for use in children. Intravesical injection of botulinum-A toxin is experimental but has been used in refractory cases of pediatric voiding dysfunction.

Anticholinergic agents. There are limited randomized placebo-controlled studies available to assess the efficacy of anticholinergic agents in children with urge syndrome/overactive bladder. Similarly, there are few agents approved by the Food and Drug Administration (FDA) for use in children. These agents include immediate release oxybutynin and sustained release oxybutynin (Ditropan). Although, not approved by the FDA, pediatric studies are being performed using tolterodine (Detrol®) in children with overactive bladder (Hjälms, Hellsström, Mogren, Läckgren, & Stenberg, 2001; Raes et al., 2001) and immediate-release trospium chloride (Sanctura®) (Lopez, Miguelez, Caffarati, Estornell, & Anguera, 2003). The goals of anticholinergic therapy in children with overactive bladder are to increase bladder capacity and decrease detrusor overactivity, which results in an increased interval between voids, increased voided volume, and dryness between voids.

Although these agents appear to be clinically effective, there are limited well-designed studies available that fully investigate these drugs. Side effects are common and should be reviewed with parents along with measures to prevent and treat the associated side effects. More commonly encountered side effects include facial flushing, dry mouth, and constipation. Children prone to constipation should be started on a bowel regimen; bowel habits should be regulated prior to starting an anticholinergic agent. Oxybutynin can affect sweating, and during the summer, it is important that parents are cautious regarding heat exposure. Concerns have been raised, particularly in the neurogenic bladder population, regarding central nervous system and cognitive side effects of oxybutynin. Palmer, Zebold, Firlit, and Kaplan (1997) noted side effects of agoraphobia, hyperactivity, headache, and insomnia in children with myelo-
dysplasia using intravesical oxybutynin chloride.

**Alpha-blockers.** The rationale for use of alpha-blockers in voiding dysfunction is based on the presence of alpha-adrenergic receptors in the bladder outlet and proximal urethra. Stimulation of these receptors leads to smooth muscle contraction and increased outlet resistance. Thus, antagonism of the alpha-receptors would lead to relaxation of the bladder outlet and proximal urethra (Restorick & Mundy, 1989). However, the role of alpha-blockers in pediatric voiding dysfunction remains investigational, and parents must be cautioned that alpha-blockers are not approved by the FDA for use in children with voiding dysfunction. Currently, there are no randomized, placebo-controlled studies evaluating the safety and efficacy of alphablockers. Limited studies have supported a role for alpha-blockers in children with dysfunctional voiding. One study demonstrated an improvement in diurnal incontinence in 83% of children and improvement in urinary urgency in 70% of children (Cain, Wu, Austin, Herndon, & Rink, 2003). Franco (2007) noted that in his experience, alpha-blockers have been effective in treating children with overactive bladder who had failed biofeedback therapy.

**Botulinum-A toxin** (Botox®) is a potent neurotoxin that blocks neuronal acetylcholine secretion by binding to presynaptic nerve endings. Botulinum-A toxin has been demonstrated to be effective in neurogenic overactivity in adults, and more recently, has been demonstrated to have high short-term effectiveness in adults for overactive bladder (Flynn, Webster, & Amundsen, 2004). There are limited studies using intravesical injection of botulinum-A toxin in children with neurogenic and non-neurogenic detrusor overactivity. Hoebeke et al. (2006) prospectively studied 21 children with refractory non-neurogenic detrusor overactivity who were injected intravesically with 100 IU of botulinum-A toxin. All children had decreased bladder capacities for age, urinary urgency, and UUI. Of the 15 children with six-month follow up, nine had resolution of urgency and UUI after one injection session, three had a partial response (50% decrease in urgency and UUI), and three did not respond. Limitations of intravesical injection of botulinum-A toxin include the need for general anesthesia in children, the lack of long-term efficacy, and subsequent treatments.

**Minimally Invasive Therapies**

**Neuromodulation** is a procedure that is approved by the FDA for the treatment of UUI, urgency-frequency syndrome, and functional urinary obstruction in adults, but it is not approved for use in children. The...
Four patients did not have noted worsening of their UI. 11% had no change, and 5% improvement, 68% had improvement, with UI, 16% had complete resolution, 68% had improvement, 16% had complete resolution, and one lead that required revision. The overall complication rate was 22%.

Surgical Therapies

Bladder augmentation is rarely required for non-neurogenic voiding dysfunction. The goal of bladder augmentation is to increase the storage function of the bladder and decrease intravesical pressure. Rarely, it may be indicated in children with non-neurogenic neurogenic bladder with persistent poor compliance and elevated detrusor pressures refractory to anticholinergic therapy and clean intermittent catheterization.

MANAGEMENT OF BOWEL SYMPTOMS

Critical to the management of pediatric voiding dysfunction is the management of any underlying bowel dysfunction. It is important to identify those children with bowel dysfunction during the initial evaluation by asking questions regarding bowel habits (see Table 2). As with voiding dysfunction, a behavioral approach to the management of bowel dysfunction is important. Bowel regimens consisting of timed attempts at having a bowel movement are important. Children are encouraged to try to have a bowel movement after meals, taking advantage of the gastrocolic reflex. It is important that the child has enough fiber in his or her diet and is drinking enough fluids. Those children who fail to improve with simple dietary and behavioral measures will benefit from the addition of laxatives, such as polyethylene glycol 3350 (Miralax®).

MANAGEMENT OF RECURRENT UTIs

Children with voiding dysfunction who develop frequent recurrent symptomatic UTIs (for example, one every two to three months) may benefit from prophylactic antibiotic therapy while the child’s underlying voiding dysfunction and bowel dysfunction are being treated. The choice of prophylaxis will vary, depending on resistance patterns in the area and the child’s prior urine culture results. However, trimethoprim-sulfamethoxazole (Bactrim®) and nitrofurantoin (Macrobid®) are typically the first-line antibiotics for prophylaxis (Committee on Quality Improvement, Subcommittee on Urinary Tract Infection, 1999). The usual prophylactic dose is one-third to one-half of the treatment dose given on a once-daily basis. More recently, the role of prophylactic antibiotics in children with recurrent UTIs has been questioned. In a review from a network of 27 primary care pediatric practices, antimicrobial prophylaxis was not associated with decreased risk of recurrent UTI but was associated with increased risk of resistant infections in the children studied (Conway et al., 2007).

MANAGEMENT OF OTHER CAUSES OF INCONTINENCE

Giggle Incontinence

There are very few studies evaluating the management of giggle incontinence. It is felt that giggle incontinence resolves by adulthood. The management of giggle incontinence varies and includes the use of anticholinergic agents in those children in whom an unstable bladder contraction is suspected (Chandra, Sahara, Shi, & Hill, 2002) and use of alpha-sympathomimetic agents or methylphenidate (Ritalin®) (Sher & Reinberg, 1996) in those in whom muscle relaxation is the suspected etiology. Timed voiding to ensure regular bladder
emptying can also help in decreasing the volume of urine lost during giggle incontinence episodes.

**Vesicovaginal Reflex (Vaginal Reflux Voiding, VaginalEntrapment)**

Proper toileting position treats vesicovaginal reflux. Children should be instructed to sit upright, all the way back on the toilet with their back against the back of the toilet bowl and legs apart.

**Primary Bladder Neck Dysfunction**

Primary bladder neck dysfunction is typically identified in young adult males with lower urinary tract symptoms (LUTS) and is managed with alpha-adrenergic antagonists medication. Alpha-adrenergic antagonists are not currently approved for use in children with voiding dysfunction. However, small studies have demonstrated their efficacy in mixed populations of children with voiding dysfunction (Austin et al., 1999; Cain et al., 2003).

**CONCLUSION**

Voiding dysfunction and UI in children is common. Both are associated with significant effects on quality of life and comorbidities, including constipation and UTIs. A careful history, physical examination, and limited laboratory evaluation is useful in determining the etiology of daytime UI. Behavioral therapy is important in all forms of functional incontinence. Medical therapy varies with the etiology. Rarely, minimally invasive and surgical alternatives are needed for refractory cases. Constipation and UTIs are often seen in children with voiding dysfunction, and these conditions must also be evaluated and treated. Behavioral therapy is important in the treatment of both voiding and bowel dysfunction. Additional therapies for voiding dysfunction will vary depending on the etiology of the child’s voiding dysfunction.

**References**


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Additional Reading